PINEWOOD FLOOD PLAIN MANAGEMENT STUDY

JEFFERSON COUNTY
ARKANSAS

COOPERATING AGENCIES

The Jefferson County Conservation District

Jefferson County

The Arkansas Soil and Water Conservation Commission

and

U. S. Department of Agriculture
Soil Conservation Service
Post Office Box 2323
Little Rock, Arkansas 72203

AUGUST 1982

TABLE OF CONTENTS

Introduction

The Jefferson County Judge and the Jefferson County Conservation District requested that the Arkansas Soil and Water Conservation Commission conduct a flood plain management study on Piney Creek in and near the Pinewood Subdivision in Jefferson County. The Commission requested assistance from the Soil Conservation Service in performing this study. The objectives of the study are to identify:

a. Areas subject to flooding from the 10 percent and 1 percent chance flood events (see glossary).

b. Existing flood damages.

c. Natural values.

d. Flood plain management alternatives.

The Pinewood Flood Plain Management Study Report was prepared in accordance with the August 1974 Joint Agreement for Flood Hazard Analysis and Flood Plain Studies between the United States Department of Agriculture, Soil Conservation Service (SCS) and the Arkansas Soil and Water Conservation Commission (AS&WCC). SCS was designated as the agency to conduct the flood plain management study by the AS&WCC. Participation by the SCS is in accordance with Federal Level Recommendation 3 of "A Unified National Program for Flood Plain Managment," and Section 6 of Public Law 83-566. The principles contained in Executive Order 11988, Floodplain Management, are addressed in this part.

The AS&WCC supplied information concerning federally subsidized flood insurance. Residents of the area provided survey rights-of-way and participated in a meeting held on June 24, 1982, where study findings were presented and comments and responses were received from the public.

Level surveys were performed by SCS personnel to obtain the topographic information required to perform the study. Water surface profiles were computed using the SCS WSP2 computer program. Peak discharges were determined from U. S. Geological Survey Water Resources Circular No. 11, "Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968" by James L. Patterson. Water surface elevations in the study area were obtained through the use of the above procedures.

Many variables are utilized in performing hydrologic studies. These variables include factors such as soil moisture condition, watershed land use, precipitation amount and time distribution, and channel characteristics that influence water flow. This study is based upon conditions existing at the time of field investigations and assumes that hydraulic structures such as bridges and culverts are not obstructed, operate properly, and do not fail.

Study Area Description

The Pinewood development is located in Jefferson County about 47 miles south of Little Rock and about four miles southwest of Pine Bluff (see the Vicinity Map on page 3. The study area extends about 0.25 mile downstream from Highway 79 and about 1.50 miles upstream. The Pinewood development extends upstream from the Highway about 0.6 mile along the north side of Piney Creek within the study area. A smaller development named Suburbia is located on the south side of the creek across from the Pinewood development. Isolated houses are located downstream from Highway 79 and at the upper end of the study area. A detailed study was made on the 1.75 miles of Piney Creek in the study area.

Piney Creek outlets into Nevins Creek which is a tributary to Bayou Bartholomew. The study area is located in the West Gulf Coastal Plain physiographic region, has rolling topography, and is mainly forestland.

The Pinewood development has a mean annual temperature of about 64 degrees Fahrenheit and mean annual precipitation of about 51 inches. Temperature extremes at Pine Bluff have ranged from minus 6 degrees F. to 112 degrees F. Annual rainfall extremes range from 82.89 inches in 1905 to 32.82 inches in 1963.

Natural Values

Soil Resources and Land Use

Soils found in this watershed are of the Sacul-Sawyer-Savannah association. These soils are moderately well drained, nearly level to gently sloping, loamy soils on upland and consist of broken ridges and narrow swales. Soils included in this association are Savannah fine sandy loam and Sawyer silt loam. The minor soils series are Ouachita, Smithdale, Phebá and Amy.

Land use in the Pinewood watershed includes 135 acres of grassland (5 percent), 2,190 acres of woodland (83 percent), 290 acres of built-up areas (11 percent), and about 15 acres (1 percent) of other (water, roads, etc.) Dispersed throughout the area are 400 acres of prime farmland which is about 15 percent of the watershed.

Fish, Wildlife, and Water Quality

Piney Creek is an intermittent bottomland stream which meanders through a narrow flood plain. Frequency and duration of flooding along this creek are not sufficient to create wetland vegetation. With the exception of the two subdivisions, the flood plain consists mainly of bottomland hardwoods. Dominate tree species are represented by sweetgum, willow oak, water oak, and white oak. The crisp tan leaves and smooth light gray bark of the American beech stand out in the winter. Beech trees provide good den sites for gray squirrel, raccoon, and oppossum. The small sweet edible nuts provide food for these animals in addition to fox and white-tailed deer. Other trees found here which provide good food and cover for wildlife include the dogwood, southern red oak, American holly, hickory, sycamore, and cottonwood.

LEGEND

Study Area

Stream

79 U. S. Highway

RD. 29 28 / 32 33

SHINE RD

28 27 / 33 34

27 26 / 34 35

CEM.

FITZHUGH RD.

RAYHAN RD

LIMIT OF STUDY

LIBERTY HILL CEM.

N PINEWOOD DR

W PINEWOOD

ELMWOOD COVE

CEDARWOOD DR.

S PINEWOOD DR

LIMIT OF STUDY

Piney Creek

SUBURBIA DR.

CUTOFF

SULPHUR SPRING - U.S. 79

LA JOLLA DR.

RUSTIE DR

RUSTIC

MILES DR

79

N

32 / 5 4

SPRING LAKE ROAD

33 34 / 4 3

SPRING LAKE ROAD

34 35 / 3 2

SORRELLS ROAD

ARKANSAS

0 1/4 1/2 3/4 1 Mile

0 1 Kilometer

SCALE

Base Map prepared by the Arkansas State Highway and Transportation Department

VICINITY MAP

PINEWOOD SUBDIVISION

FLOOD PLAIN MANAGEMENT STUDY

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LITTLE ROCK, ARKANSAS

USDA—SCS—FORT WORTH, TEXAS 1982

Although very little ground cover is evident due to the maturity of the forest canopy, partridge-berry with its small evergreen leaves and bright scarlet berries grows in isolated patches on the forest floor. Also occurring in areas of open sunlight are thick clumps of honeysuckle and greenbrier which sometime form tangled thickets. These thickets provide suitable habitat for songbirds, small mammals, amphibians and reptiles.

The water quality in the stream from Highway 79 to the upper limit of the study area should be of good quality based on existing land use. However, the reach of stream from the outfall of the Pinewood Subdivision at Highway 79 downstream to the lower limit of the study area may be degraded, especially during periods of low flow. Runoff from streets flows directly into the stream but poses no immediate problem. Fish habitat is very limited due to the lack of sufficient water flow during most of the summer and fall months. A few existing pools of water provide habitat for those species of minnows and sunfish adapted to life in stagnant pools.

Flood Problems

A one percent chance flood event would inundate 89 acres in the study area. The area covered by this event is shown in the Flood Plain Management Area Map on page 8. Flood plain land use is all woodland except for the area where the houses are located. The one percent chance flood would flood 19 houses and the pump and electric motor on the sewage plant serving the area. Seventeen houses subject to flooding are located upstream from Highway 79 and two houses are located immediately downstream. These houses were built about 1978 while Highway 79 was constructed in 1941. No commercial establishments are located in the flood plain. Damages from a one percent chance event are estimated to be $307,200.

Flood problems upstream from Highway 79 are aggravated by the elevation of the houses in relation to the height of the highway fill. All of the houses upstream from the highway are built on concrete slabs. The low elevation of the road fill is 250.6 feet while the elevation of the slab floor on the lowest house is 247.5 feet. An increase in depth of water at the highway to force water through the highway structure will result in flooding in the houses. The one percent chance flood flows at a depth of 0.5 feet over the highway fill. It was reported by the Jefferson County Conservation District that six houses in the area suffered in-house flooding on Friday, June 5, 1981. The precipitation gage at the Pine Bluff Airport recorded 3.9 inches of rainfall in eight hours on this date. This was about a 5-year frequency rainfall.

The boundary of the flooded area is shown on the Flood Plain Management Area Map on page . A profile of the stream is in the Technical Appendix and includes flood profiles for the one and 10 percent chance floods. These two items can be used to determine the extent of flooding at a selected location in the study area.

Existing Flood Plain Management

The Pinewood study area is an unincorporated area in Jefferson County and is, therefore, subject to regulation by county ordinances concerning development. Flood elevations in the area have been available since the Corps of Engineers published its Pine Bluff Urban Water Management Study in 1979. However, the Corps study did not identify structures subject to flooding or evaluate alternatives to reduce flood damages. Public interest is high in the area due to repeated flood damages, and participation in an implementation program would be active if local funding were available.

Alternatives for Flood Plain Management

Present Condition

Development in the floodplain has occurred in about the last five years. No residential, commercial, or other construction is currently in progress, perhaps as a result of the flooding experienced in the area. Little development is occurring in the watershed outside the floodplain. However, if extensive future development should occur the flooding problem in the flood plain could worsen because of an increase in the rate and amount of runoff. Residents of the county are eligible to purchase insurance under the emergency flood insurance program.

Nonstructural Measures

Nonstructural measures identified as feasible for solving flood problems in the Pinewood area include acquisition of properties, floodproofing, zoning, building and development codes, and flood insurance. These measures are intended to avoid or minimize flood losses but do not modify the flood.

1. Acquisition - Acquisition consists of purchasing flood prone structures, removing them from the flood plain, and restricting land use in the flood plain. Relocation of the structures is not practical as all of the houses subject to flooding are built on concrete slabs. This alternative is estimated to cost approximately $1,100,000.

2. Floodproofing - Floodproofing in the Pinewood area would require measures to prevent water from entering individual houses. This would probably require a levee or some other method to divert water away from the structure. This alternative might not be acceptable, particularly where the structures are flooded to depths in excess of two feet and excessive levee heights would be required. Disposal of water within the leveed areas would also have to be addressed.

3. Zoning - Zoning would include a means of controlling development within the designated floodplain. A county ordinance would probably be required and enforcement would be necessary to insure compliance. This alternative would not have any impact on current flood damages but would prevent additional construction in the flood prone area.

4. Building and Development Codes - This alternative is similar to zoning in that it recognizes that development must be controlled in the flood prone area. In addition, if local officials decide that some development in the flood plain is feasible, building codes should be enacted to dictate the type of construction which could be accomplished. For example, a building code could require that all structures be built at an elevation higher than the elevation of the one percent chance flood. This alternative would allow controlled development in the flood prone area and prevent flood damages to structures built in the future. If extensive development occurs an analysis of expected flood elevations should be made. However, this alternative would not have any impact on current flood damages.

5. Flood Insurance - Flood insurance is available in the unincorporated areas of Jefferson County under the emergency program as no detailed study has been published. While flood insurance will not prevent flood losses, it will reimburse property owners for flood damages. Hydraulic data developed during this study should be sufficient for flood insurance purposes.

Structural Measures

Structural measures include features to modify or control the flood to reduce losses. Structural measures include dams, channels, dikes or other appropriate means. No dam sites are available in the Pinewood area to store floodwater. A dike or levee to convey the water past the houses is not practical because of the limited space available for construction. Identified structural measures include channel work and alteration of the Highway 79 road and bridge.

Channel work would consist of enlarging, widening, and deepening the existing channel to provide the capacity to carry at least a ten percent chance flood. The structure on Highway 79 (two 8' X 8' concrete box culverts) would be enlarged or replaced with a bridge. Participation of the Arkansas State Highway and Transportation Department in such a project would depend upon the availability of funds. Due to excessive channel velocities stabilization measures such as riprap would be required in the channel. Channel work would be required about 1,800 feet upstream from Highway 79 and would extend downstream until the water could be safely released into the flood plain. Cost of this alternative is estimated to exceed $1,000,000.

Combination of Alternatives

Participation in the flood insurance program, floodproofing of individual structures where possible, and enforcement of zoning, building and development codes appear to be the best cost effective combination of alternatives to reduce flood damages or reimburse property owners for damages. However, this combination may not be socially acceptable because of the extreme flood damage occurring to some of the structures. Some structural alternative consisting of channel work and road structure alteration, in conjunction with acquisition and removal of some of the more seriously damaged structures, would be necessary to completely solve the flooding problem. The expected cost of this combination as compared to the benefits would appear to make this an economically unsound alternative based on the present damages. Jefferson County should use the results of this study to implement a program of flood plain management for this area.

FLOOD PLAIN MANAGEMENT AREA

PINEY CREEK

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PINEWOOD FLOOD PLAIN MANAGEMENT STUDY
JEFFERSON COUNTY, ARKANSAS

GLOSSARY

Flood Damages: The destruction or injury of property due to rising water levels. In this study, flood damages were assumed to occur when the flood water elevation equaled or exceeded the lowest opening point into the damageable property.

Flood Frequency: An expression or measure of how often a hydrologic event of given size or magnitude should, on an average, be equaled or exceeded. For example, a 10-year frequency flood is equaled or exceeded in size, only once in 10 years on the average or has a 10 percent chance of occurring during any given year.

Flood Plain: A land area next to a stream which is periodically covered by floodwater.

Flood Proofing: Changing a structure and/or its contents so that water is kept out of the structure or the damage caused by water entry is reduced.

Flow Restrictions: An obstacle which limits the volume of water which passes through a specific section: for example, dikes, dense vegetation, levees, culverts, bridge openings, buildings and/or similar structures.

Level Surveys: The gathering of data with engineering equipment using horizontal and vertical distances to depict the features of stream valleys.

Peak Discharge or Peak Flow: The maximum volume of water per unit time that is expected to run off from an area.

Percent Chance: 100 divided by the flood frequency in years.

Prime Farmland: The soil that is best suited for producing food, feed, forage, fiber and oilseed crops. It gives the highest yields with minimum inputs of energy and money and results in the least damage to the environment. It includes all capability Class I soils, more than 80 percent of Class II soils, and less than a third of the Class III soils.

BIBLIOGRAPHY

1. Patterson, James L., Floods in Arkansas, Magnitude and Frequency Characteristics Through 1968, Water Resources Circular No. 11, U. S. Geological Survey, Little Rock, Arkansas 1971.

2. Technical Release 61, WSP2 Computer Program, Engineering Division, USDA, SCS, May 1975.

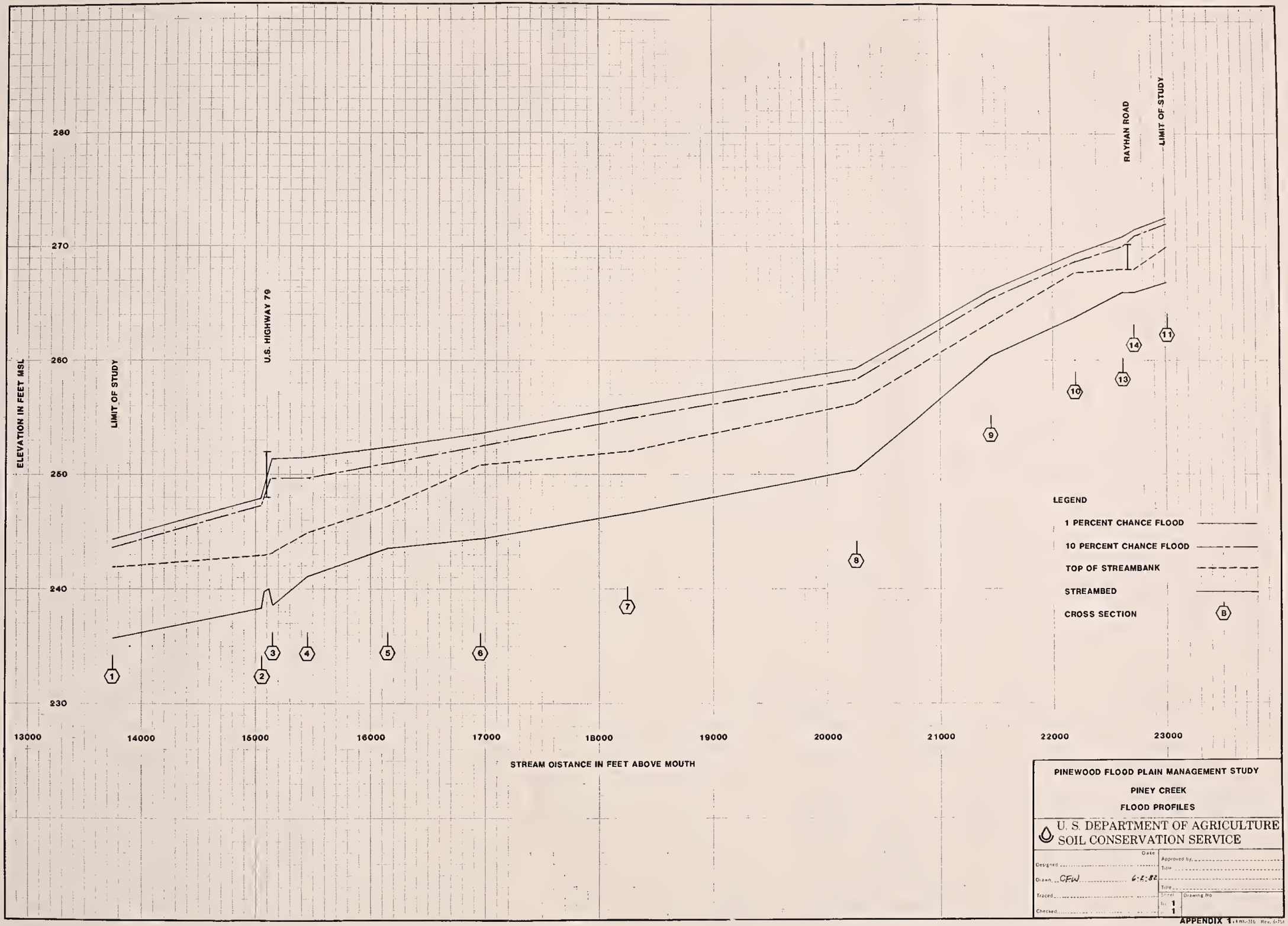
3. Pine Bluff Comprehensive Flood Control Plan, Urban Water Management Study, U. S. Army Corps of Engineers, Vicksburg, Mississippi, August 1979.

4. Soil Survey of Jefferson and Lincoln Counties, Arkansas, USDA Soil Conservation Service in Cooperation with Arkansas Agricultural Experiment Station, December 1980.

BENCHMARK DATA

Benchmark - Chiseled "X" on top of north end of east headwall on box culverts under U. S. Highway 79, 100 feet south of South Pinewood Drive. Elevation 249.71.

TECHNICAL APPENDIX



PINEWOOD FLOOD PLAIN MANAGEMENT STUDY

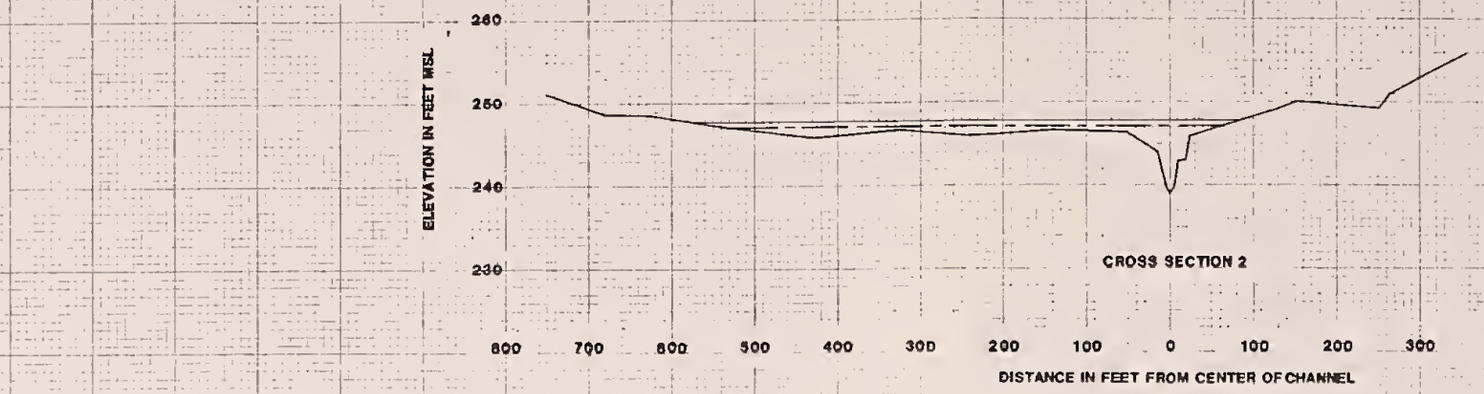
PINEY CREEK

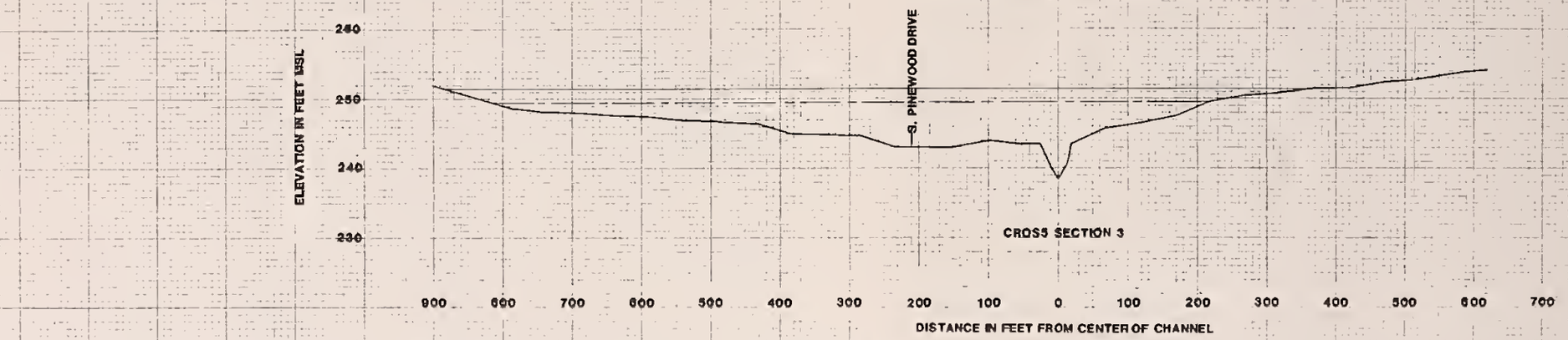
FLOOD PROFILES

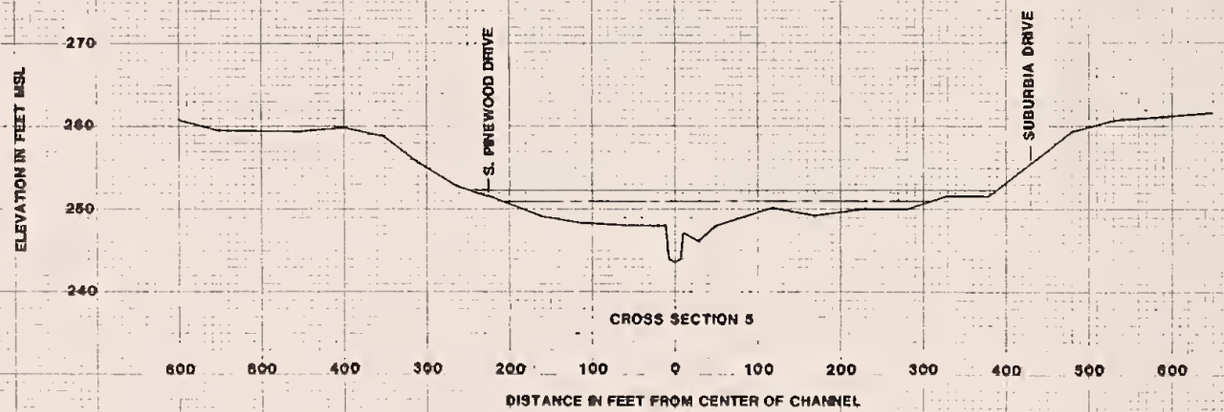
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

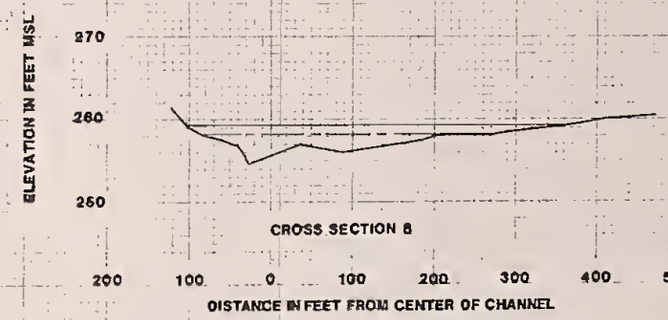
	Date		
Designed		Approved by	
Drawn CFW	6-8-82	Title	
Traced		Title	
Checked		Sheet No. 1 of 1	Drawing No.

APPENDIX 1









ALL SECTIONS LOOKING DOWNSTREAM

LEGEND

.1 PERCENT CHANCE FLOOD

10 PERCENT CHANCE FLOOD

PINEWOOD FLOOD PLAIN MANAGEMENT STUDY

PINEY CREEK

TYPICAL CROSS SECTIONS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed		Approved by	
Drawn CFW	6-2-82	Title	
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APPENDIX 2

APPENDIX 3

CROSS SECTION DATA

PINEWOOD FLOOD PLAIN MANAGEMENT STUDY

CROSS SECTION (No.)	DRAINAGE AREA (Sq. Mi.)	10-PERCENT CHANCE EVENT		1-PERCENT CHANCE EVENT	
		DISCHARGE (cfs)	ELEVATION (Feet)	DISCHARGE (cfs)	ELEVATION (Feet)
1	4.11	1642	243.6	3065	244.3
2	2.74	1200	247.3	2240	247.9
3	2.74	1200	249.7	2240	251.4
4	2.52	1124	249.7	2098	251.5
5	2.48	1107	251.0	2067	252.4
6	2.38	1075	252.5	2006	253.6
7	2.30	1042	254.9	1945	255.9
8	1.38	704	258.3	1314	259.3
9	1.29	665	265.4	1242	266.1
10	1.08	578	268.7	1080	269.4
13	1.05	567	270.0	1059	270.9
14	1.05	567	271.0	1059	271.5
11	1.02	556	272.0	998	272.6

APPENDIX 4

INVESTIGATIONS AND ANALYSES

Topographic information used in this report was gathered by SCS personnel. Additional topographic information was obtained from U. S. Geological Survey Quadrangle maps. Aerial photographs were obtained from the U. S. Department of Agriculture, Agricultural Stabilization and Conservation Service Aerial Photography Field Office in Salt Lake City, Utah.

A staff biologist and a resource conservationist evaluated the study area to determine land use, soils, and fish and wildlife resources. Aerial photographs and published soil surveys were utilized in the determination. The findings have been incorporated into this report.

Water surface profiles were computed using survey data and various other parameters as input into the SCS WPS2 computer program. Output from this program included elevation-discharge curves at specific cross sections listed in Appendix 3. Peak discharge was computed for the 1 and 10 percent chance flood events by using Geological Survey Water Resources Circular No. 11. By combining the computed peak discharges and the elevation - discharge curves the elevations for the floods were obtained at each cross section. Field surveys were made to determine the elevation of each house. Depth of flooding in each house was determined by comparing this elevation with the elevation of the flood profile at that particular station. A staff economist determined the damages from the one percent chance flood by using the depth of flooding and the estimated value of the property.

The width of the flooded area was determined at each of the cross sections shown in Appendix 3. This was done by using the elevation of the flood profile at that location and determining the point at which that elevation intersected the ground on the plotted cross section. The flood boundary between cross sections was delineated by interpolation between the sections and through the use of quadrangle maps and additional surveys.

Alternatives for flood plain management were determined by additional computer runs to evaluate channel work, road structure alteration, and a dike to protect the structures.

A comparison of SCS data and Corps of Engineers data in their report covering the Pinewood area revealed that the Corps flood profile elevations exceeded the SCS elevations. A conference was held on May 25, 1982 at the Vicksburg District office to resolve this conflict. The apparent reason for the difference was that the SCS used more cross sections in its analysis and the cross sections extended across the entire floodplain width, whereas the Corps used only a limited number of channel cross sections. In a letter dated June 11, 1982 the Corps stated that the SCS study in the Pinewood area superceded its study.

The Arkansas Highway and Transportation Department Hydraulics Section made a hydraulic analysis of the U. S. Highway 79 road structure and adjacent area. Results of their study were compared with the SCS study and were found to be in agreement.

A public meeting was held on June 24, 1982 to present the study findings to the local people. This meeting, which was advertised in a local paper, was attended by 50 persons. Study results were accepted in general with most discussion centered about which is the best alternative and how it could be financed.